

ANNUAL REPORT

1962

TOWN OF ORANGEVILLE

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ANNUAL REPORT

1962

ON THE

TOWN OF ORANGEVILLE

WATER POLLUTION CONTROL PLANT

OWRC PROJECT NO. 58-S-16

TOWN OF ORANGEVILLE WATER POLLUTION CONTROL PLANT

OPERATED FOR

THE TOWN OF ORANGEVILLE

BY

THE ONTARIO WATER RESOURCES COMMISSION

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PREPARED BY

THE DIVISION OF PLANT OPERATIONS

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TOWN OF ORANGEVILLE

I HISTORY

The Town of Orangeville up to 1959 was operating a sewage plant which had been in service for many years and was proving inadequate under the conditions of flow and required treatment results. The Consulting Engineering firm of Proctor and Redfern was retained by the town to design a new plant to be built with the assistance of the Ontario Water Resources Commission. A contract was awarded to Frid Construction Company Limited and in May of 1960 the new portions of the plant consisting of a pump house and control building, grit channels, primary clarifier, overflow division chamber and chlorine contact chamber were placed in operation. The existing sections of the plant were renovated and placed in operation in December of 1960.

II PLANT DESIGN

The plant was designed to serve a population of 7500 with a per capita discharge of 100 gallons per day.

Of the 750,000 gallons per day which the plant is capable of handling, all receives primary treatment. The design strength for the sewage is 200 ppm B.O.D. with a primary reduction of 36% and 250 ppm suspended solids with a primary reduction of 60%.

At present the plant is capable of providing secondary treatment for 250,000 gpd only.

The following is a list of the various units comprising the plant together with design data and year of installation.

Inlet to Raw Sewage Pump Well
- 30 inch diameter sewer pipe.

Coarse Screen (at pump well) - 1960
- 1.25 in. x 0.25 at 2 in. centres.

Raw Sewage Pump Well - 1960
- 15 ft. x 10 ft. x 8 ft. (overflow)
- 1200 cu. ft. or 7480 gallons.
Retention - 14.4 minutes at design flow -
750,000 gpd.

Raw Sewage Lift Pumps - 1960
2 - Smart-Turner vertical centrifugal pumps each
rated at 300 gpm at a head of 20 feet. Each is
driven by a 3 HP General Electric motor.
1 - Smart-Turner vertical centrifugal pump rated
at 500 gpm at a head of 25 feet and driven by a
7.5 HP General Electric motor.

Grit Channels - 1960

Screens - 1.25 in. x 0.25 in. at 2 inch centres.
Channels - 2 each 25 ft. x 1.896 ft. (top of wall)

Water Depth - 0.366 ft. at 1 fps.

Primary Clarifier - 1960

Size - 35 feet diameter by 12 feet deep (S.W.D.)

Capacity - 1520 cu. ft. or 72,000 gallons.

Retention - 2.31 hours at 750,000 gpd

Surface settling rate - 780 gal/sq. ft. at surface area/day.

Weir overflow rate - 7.350 gal./lin. ft. of weir/day.

Raw Sludge Pump - 1960

1 - Carter plunger type rated at 75 gpm
at a head of 15 feet and driven by a 2 HP
General Electric motor.

Division Chamber - 1960

- divides flow to aeration tanks or chlorine contact chamber.

Aeration Tanks - 1929

Size - 2 tanks each 84 ft. x 8 ft. x 8 ft.
deep.

Capacity - 5380 cu. ft. each or 67,000 gal.
total.

Retention - 6.44 hours at 250,000 gpd.

Air Blowers - 1929

2 - Babcock-Wilcox and Goldie-McCulloch air
blowers each rated at 230 cfm at 10 psig and
each driven by a Lancashire Dynamo and Cripto
20 HP electric motor.

Return Sludge Pump

1 - Smart-Turner pump rated at 75 gpm at a
head of 25 feet and driven by a 1.5 HP General
Electric motor.

Final Settling Tanks

Size - 2 tanks each 14 ft. x 14 ft. x 7.5 ft.
deep (average liquid depth)

Capacity - 1520 cu. ft. each or 18,950 gallons.

Retention - 1.82 hours at 250,000 gal. per day
Surface settling rate - 638 gal./sq. ft. of
surface area/day at 250,000 gpd.
Weir overflow rate - 1,300 gal./lin. ft. of
weir/day at 250,000 gpd.

Chlorine Contact Chamber - 1960
Size - 29.75 ft. x 12 ft. x 6.92 ft. deep
(max. liquid depth)
Capacity - 2470 cu. ft. or 15,400 gal.
Retention - 29.6 minutes at 750,000 gpd.

Chlorinator - 1960
1 - Wallace and Tiernan bell-jar type chlorinator
with a maximum rated capacity of 75 pounds of
chlorine per day.

Miscellaneous Pumps

- (a) sump pump in control building.
 - 1 - Jacuzzi Universal submersible sump pump
driven by 1/3 HP Jacuzzi Universal electric
motor.
- (b) Primary Effluent Well Pump
 - 1 - Wemco torque flow pump rated at 150 gpm
at a head of 25 feet and driven by a 3 HP
General Electric motor.
- (c) Sump pump in Old Control Building.
 - 1 - Kenco Multi-Purpose pump rated at
1000 gpd at a head of 15 feet and driven
by a 1/3 HP Kenco electric motor.
- (d) 1 - Burgess-Manning Pen Flowmeter with
totalizing, indicating and recording attach-
ments.

Sludge Holding Tank
Size - 18.5 ft. diameter x 15 ft. deep
Capacity - 4030 cu. ft. or 25,125 gallons.

III PLANT OPERATION

A) HYDRAULIC LOADING

During the year, the plant treated a total of 161.6 million gallons (see Figure 1). This represents an average daily flow for the year of 443,000 gallons or a per capita flow of 94 gallons per day. The maximum and minimum daily flows recorded were on April 12th (909,000 gal) and September 23rd (290,000 gals.) see Table I.

During periods of peak flows it becomes necessary to by-pass that portion of raw sewage flow in excess of 750,000 gallons. This became necessary for a total of 396 hours in 1962.

An examination of Figure 2 indicates that the flow pattern for 1961 and 1962 is quite similar. In both years the peak flows occurred during the spring run-off.

Figures 3 and 4 are probability graphs showing the percent of time that the flow is equal to or greater than a certain value. Figure 3 shows that 50% of the time the flow is equal to or greater than 500,000 gallons per day. Figure 3 also indicates that the design capacity of 750,000 gallons per day is exceeded 11% of the time.

As mentioned previously the hydraulic capacity of the secondary section is 250,000 gallons per day, however for plant efficiency it has been found that only 170,000 gal. can be treated satisfactorily by the secondary section.

Figure 3 illustrates that 50% of the time the total flow through the plant is 500,000 gallons per day of which 330,000 gallons receives no secondary treatment. It also illustrates that 11% of the time the total flow through the plant is 750,000 gallons per day of which 580,000 gallons is not receiving secondary treatment.

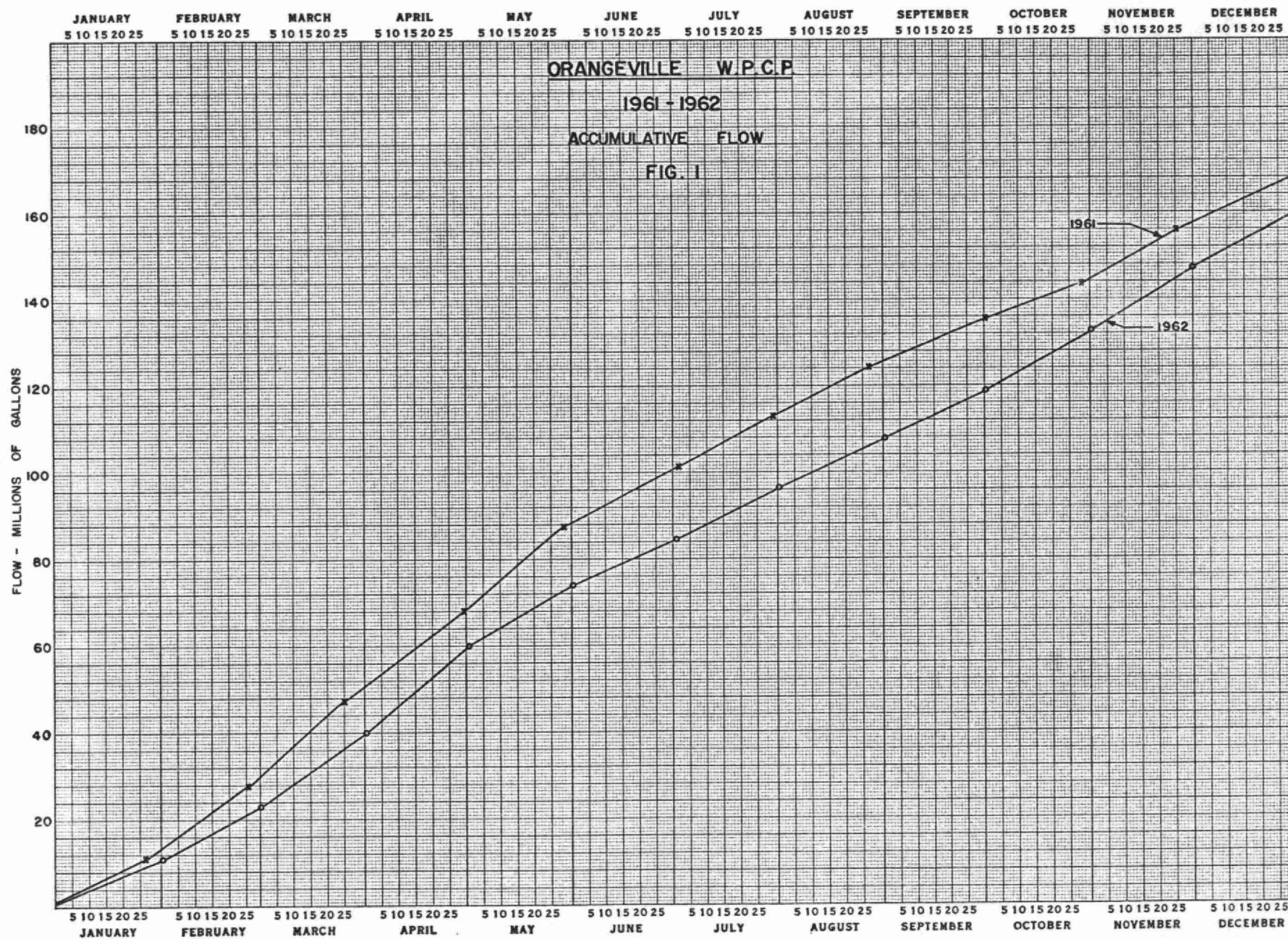
TABLE I
ORANGEVILLE WATER POLLUTION CONTROL PLANT

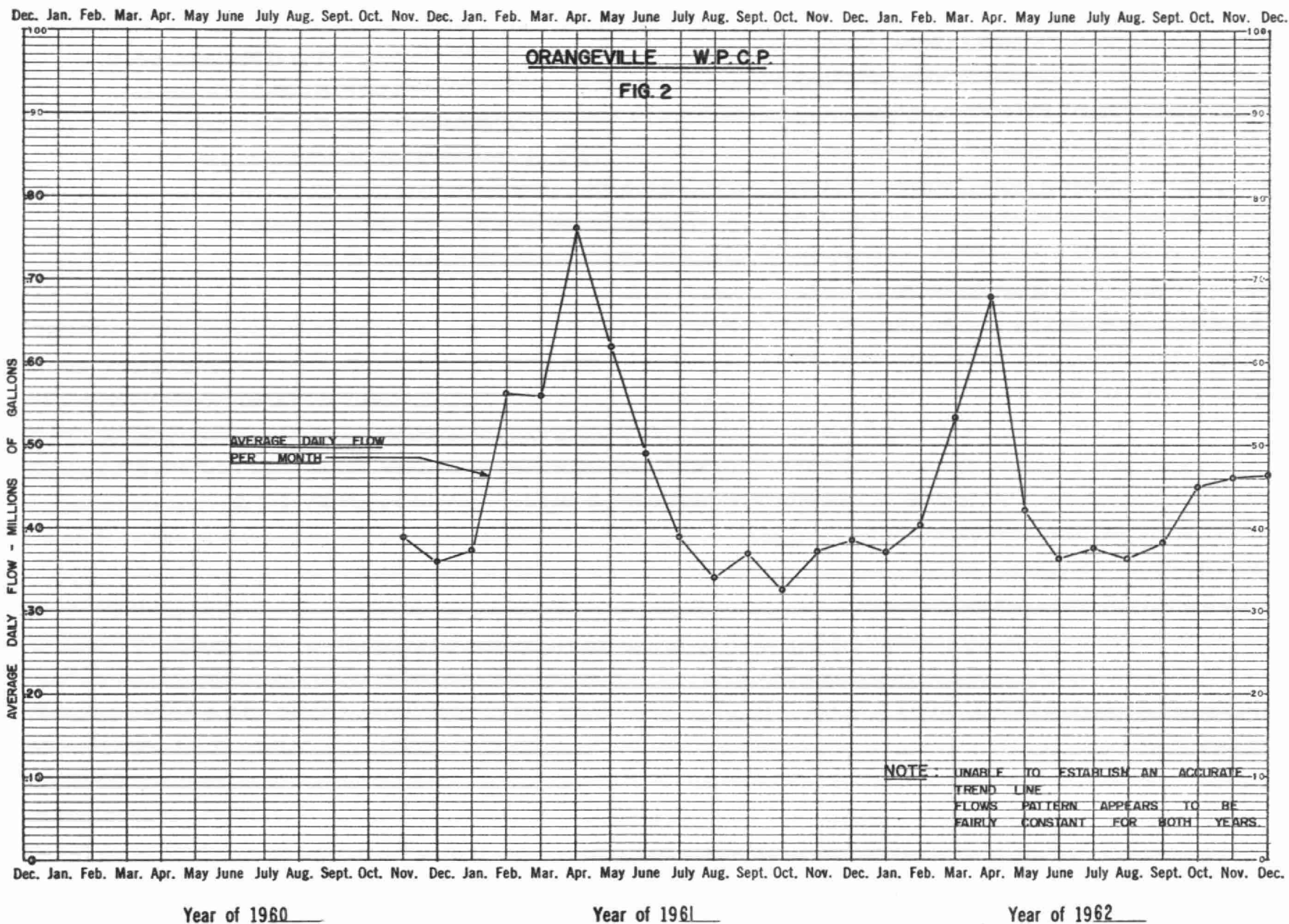
FLOWS

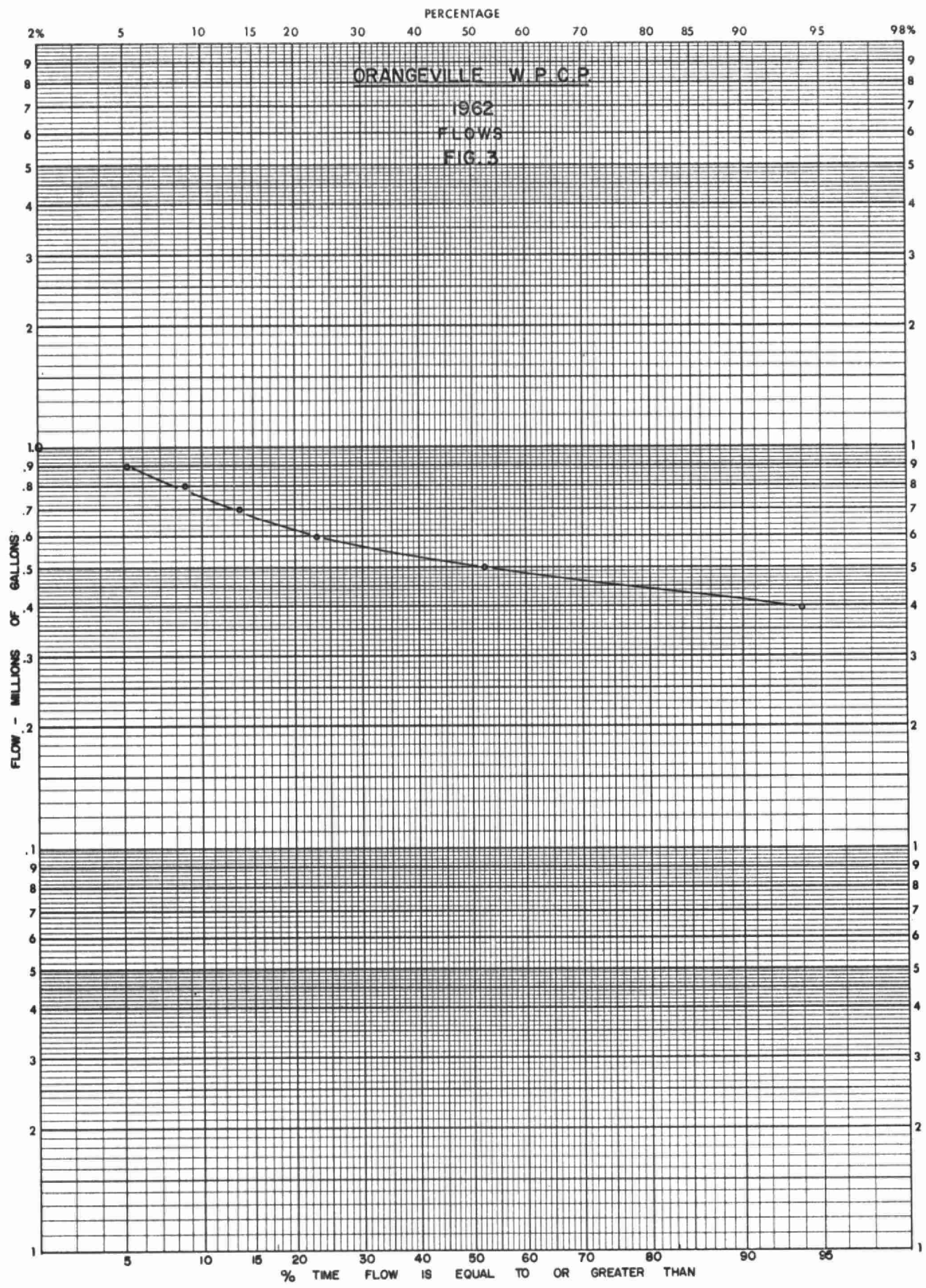
MONTH	TOTAL FLOW M.G.	AVER. FLOW M.G.D.	MAX. FLOW M.G.D.	MIN. FLOW M.G.D.	MAX. FLOW RATE	MIN. FLOW RATE
Jan.	11.488	.371	.430	.319	1.008	0
Feb.	11.500	.411	.500	.359	1.008	0
March	16.988	.548	.885	.428	1.008	0
April	21.437	.715	.909	.448	1.008	0
May	13.039	.421	.534	.328	1.008	0
June	10.746	.358	.453	.314	1.008	0
July	11.701	.377	.648	.282	1.008	0
Aug.	11.298	.364	.467	.308	1.008	0
Sept.	11.030	.368	.783	.290	1.008	0
Oct.	14.198	.458	.752	.321	1.008	0
Nov.	14.042	.468	.770	.361	1.008	0
Dec.	14.181	.457	.835	.355	1.008	0

Total 161.648

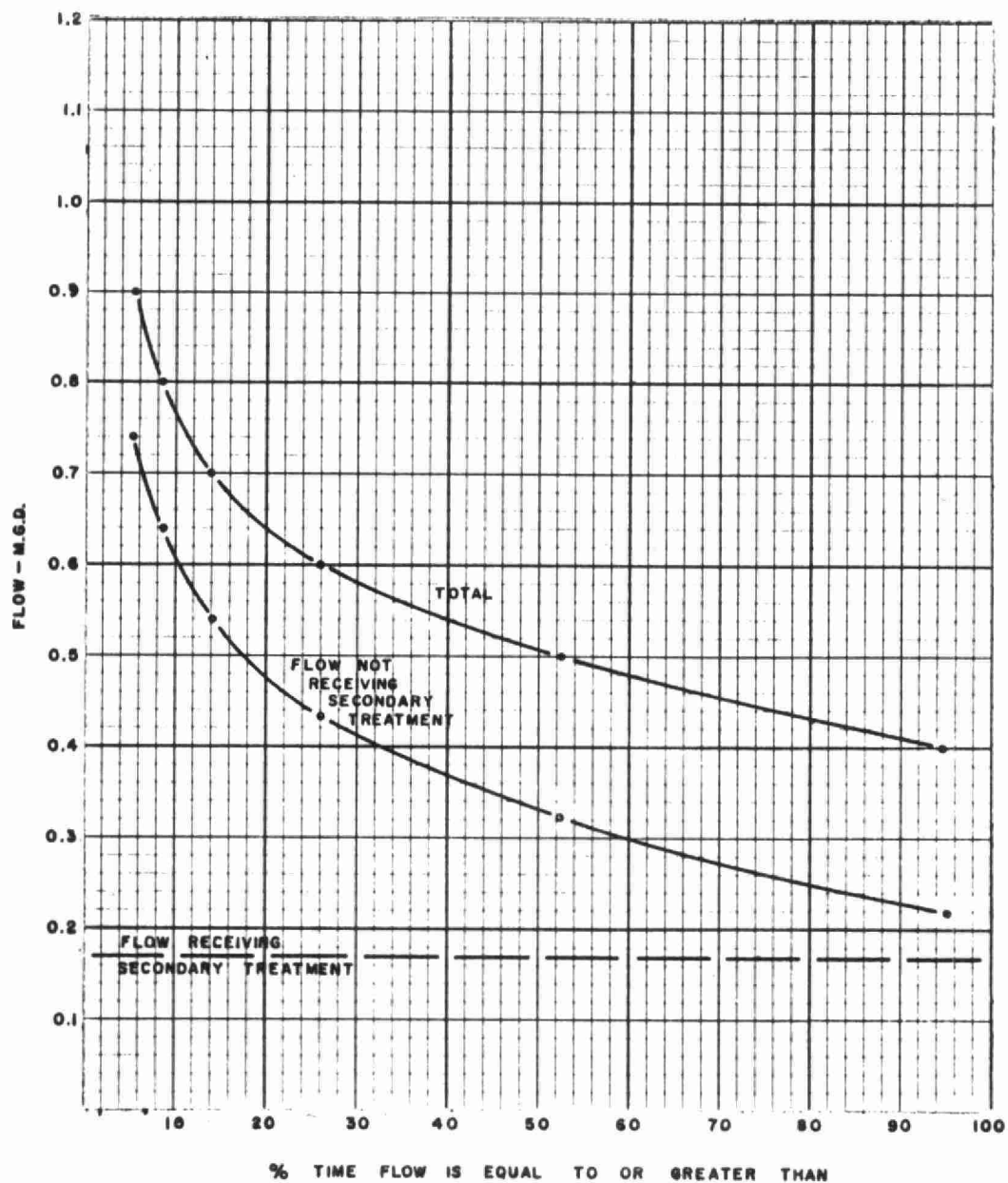
Note: Total number of hours of by-passing flow 396 (or 4.5%)







ORANGEVILLE W.P.C.P.
PRIMARY & SECONDARY FLOWS
FIG. 4



B) GRIT REMOVAL

The total amount of grit removed in 1962 was 454 cu. ft. This represents 2.8 cu. ft. per million gallons of sewage. An examination of Table II will show however that 282 cu. ft. or 62% of the total grit removed resulted in November and December when heavy rains were experienced.

The figure of 2.8 cu. ft. of grit per million gallons of sewage is comparable to that obtained from other similar installations. However, due to the inefficiency of the grit removal facilities, large volumes of grit are carried into the primary clarifier. It became necessary to remove this grit from the clarifier in November and it was not possible to record this quantity.

It is therefore obvious that the actual grit removal at this plant is considerably in excess of 2.8 cu. ft. per million gallons of sewage treated.

TABLE II
ORANGEVILLE WATER POLLUTION CONTROL PLANT
GRIT REMOVAL

<u>MONTH</u>	<u>CU. FT. GRIT REMOVED</u>	<u>TOTAL FLOW M.G.</u>	<u>CU. FT. GRIT PER M.G.</u>
January	-	11.488	-
February	-	11.500	-
March	-	16.988	-
April	126	21.437	5.9
May	-	13.039	-
June	-	10.746	-
July	10	11.701	.85
August	6	11.298	.58
September	-	11.030	-
October	30	14.198	2.1
November	195	14.042	*14
December	87	14.181	6.1
Total for Year	454	161.648	2.8
Average for Year	38 cu.ft./ month	13.4 mg/month	

*Excessive grit for November due to heavy storm washing sand from streets and flushing sewers and mains.

C) PLANT PERFORMANCE

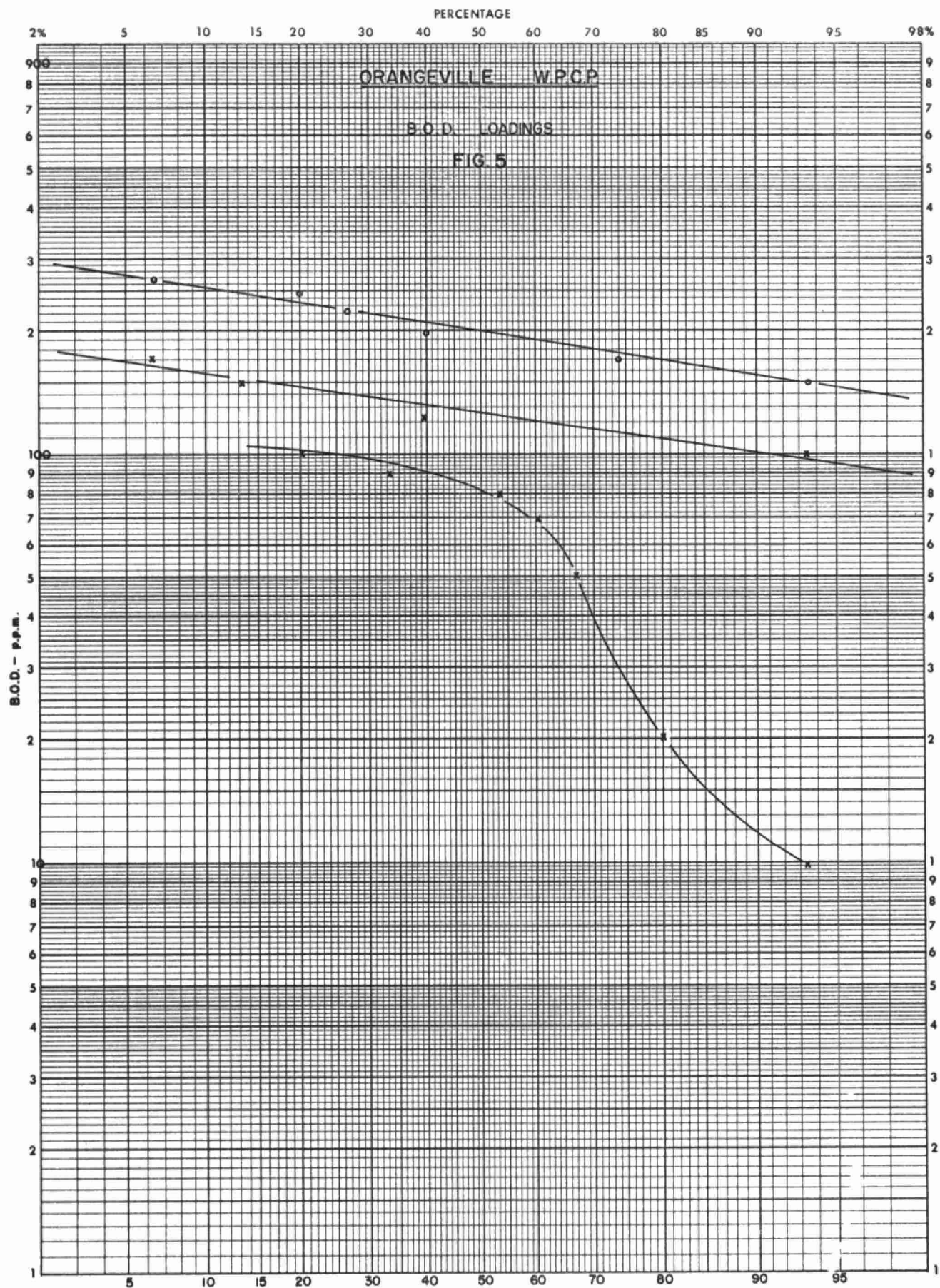
Sixteen sets of samples were collected for laboratory analyses during the year to determine the plant performance.

The average raw sewage B.O.D. and suspended solids were 205 and 193 ppm respectively, therefore the plant received 890 pounds B.O.D. and 855 pounds suspended solids per day.

Figure 5 illustrates that 50% of the time the raw sewage B.O.D. is equal to or greater than 200 ppm and Figure 6 demonstrates that 50% of the time the raw sewage suspended solids is 175 ppm.

There is one circular primary clarifier with a volume of 1520 cu. ft. or 72,000 Imp. gallons which will provide a detention time of 2.31 hrs. at design flow. The annual average daily flow was 443,000 gal. per day resulting in an average detention time of 4.0 hours. The average surface settling rate was 461 Imp. gallons per square foot of tank per day, and the average weir overflow rate was 396 Imp. gallons/ft. weir/day.

The clarifier was designed to remove 540 pounds of B.O.D. and 1120 pounds of S.S. per day which represents a 36% and 60% reduction respectively. On the basis of the samples analyzed, the average primary B.O.D. reduction was 33.4 and the average primary suspended solids reduction was 57%.



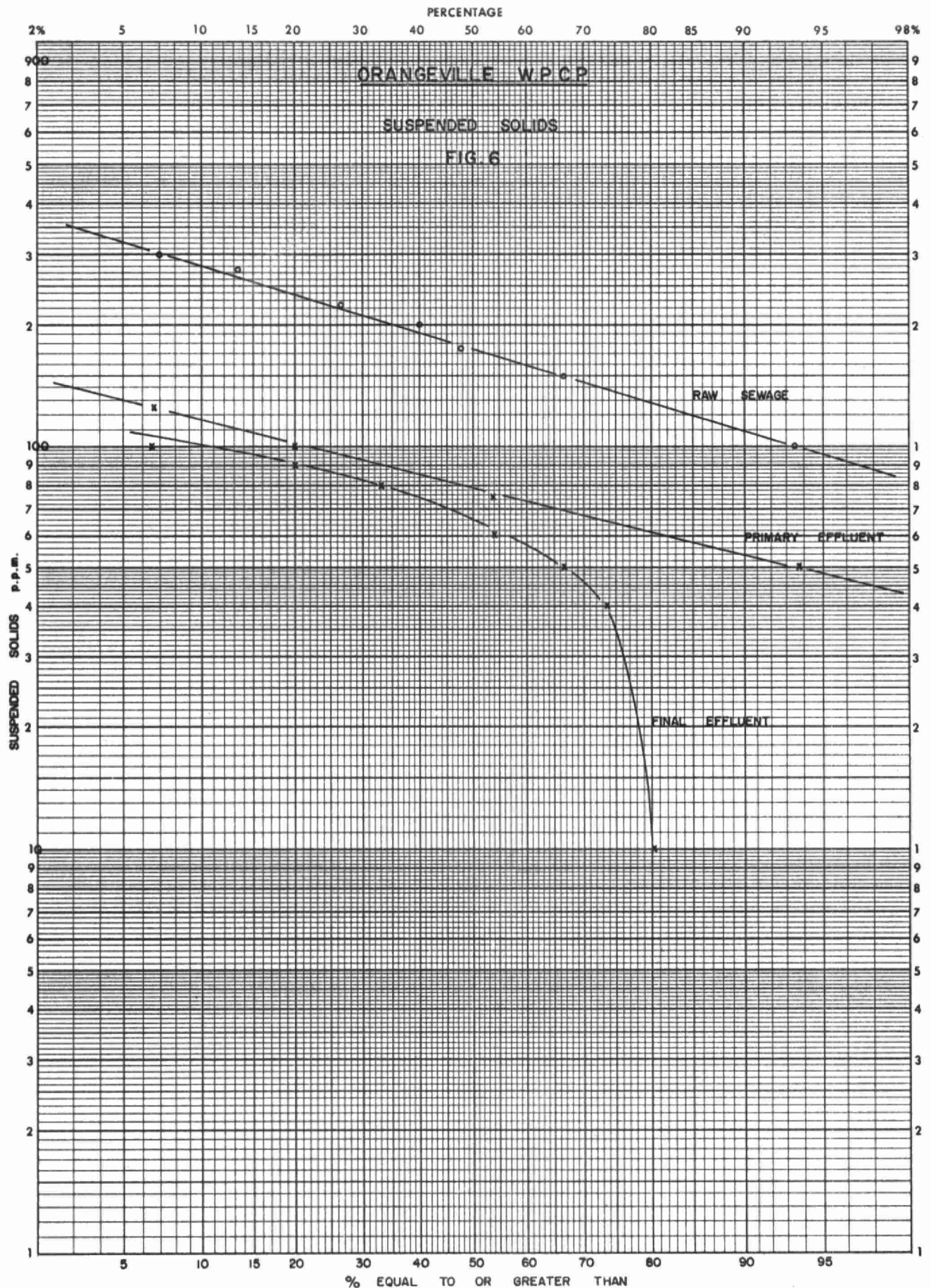


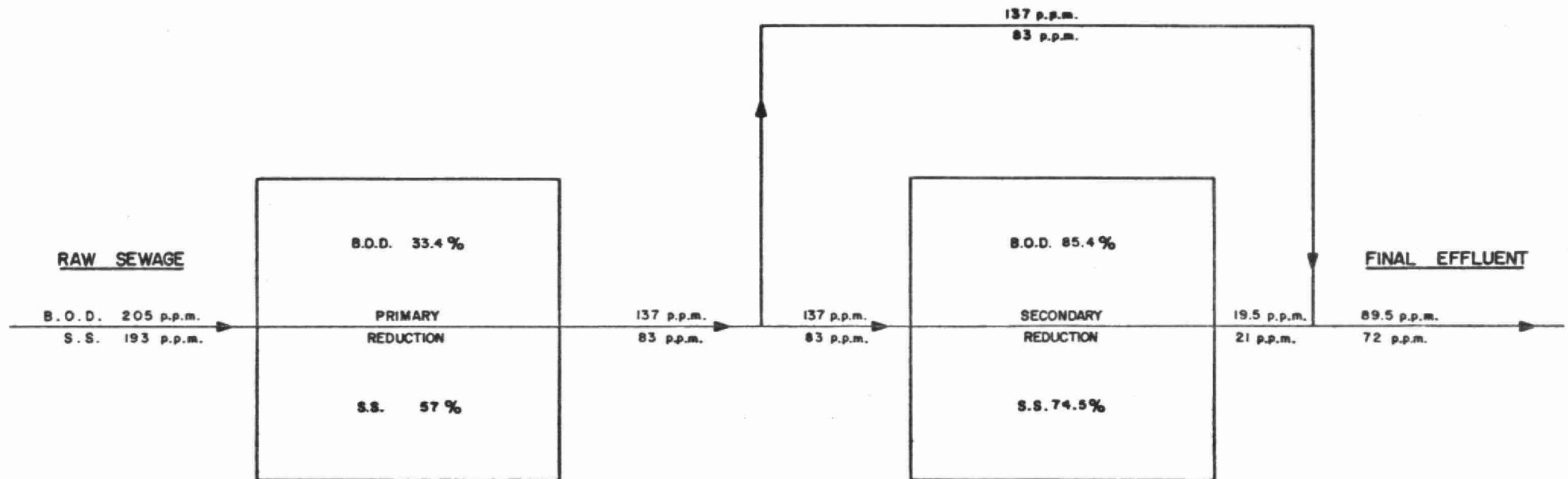
Figure 5 illustrates that 50% of the time the primary effluent B.O.D. is equal to or greater than 126 ppm while Figure 6 shows that 50% of the time the primary effluent suspended solids is equal to or greater than 78 ppm.

As has been mentioned previously only 170,000 gallons per day of the primary effluent receives secondary treatment, or approximately 38% of the average daily flow. Analysis indicate for that portion of the primary effluent receiving secondary treatment there is a further 85% and 75% reduction in B.O.D. and suspended solids respectively. These figures therefore indicate that the old secondary section of the plant is performing satisfactorily.

However, due to the fact that only 38% of the average daily flow receives secondary treatment the overall plant reduction for the B.O.D. and suspended solids is 56% and 63% respectively. For a more detailed explanation of the various phases of reduction refer to Figure 7.

ORANGEVILLE W.P.C.P.
SCHEMATIC SKETCH SHOW EFFICIENCIES
OBTAINED BY PRIMARY & SECONDARY UNITS

FIG. 7



NOTE: OVERALL PLANT EFFICIENCY
B.O.D. = 56 %
S.S. = 63 %

ABOVE LOADINGS BASED ON AVERAGE DAILY FLOW OF 443,000 I.G.P.D.

B.O.D. - RAW SEWAGE 205 p.p.m.
S.S. - RAW SEWAGE 193 p.p.m.

TABLE III
ORANGEVILLE WATER POLLUTION CONTROL PLANT
B.O.D. LOADING & REMOVAL

MONTH	RAW SEWAGE		PRIM EFF.		PRIM. REMOVAL		FINAL EFF.		TOTAL REMOVAL	
	PPM	LBS/DAY	PPM	LBS/DAY	LBS/DAY	%	PPM	LBS/DAY	LBS/DAY	%
Jan.	200	760	135	525	235	32.2	97	380	380	50
Feb.	205	840	144	590	250	30	70	315	525	66
March	177	970	126	690	280	29	103	565	405	42
April	177	1210	119	670	540	33	94	675	535	47
May	177	745	108	455	290	39	74	310	435	58.3
June	170	666	105	420	247	37	70	273	383	59
July	240	900	120	450	450	50	12.5	47	853	95
Aug.	-	-	-	No record		-	-	-	-	-
Sept.	275	1006	215	791	215	22	13	47	961	95
Oct.	310	1420	150	685	710	51.5	8.4	39	1381	97
Nov.	275	1166	142	602	564	48.5	79	335	831	71
Dec.	-	-	-	No record		-	-	-	-	-
Average	205		137				89			56

Note: Averages are based on the average of all samples for the year, not on monthly averages.

TABLE IV
ORANGEVILLE WATER POLLUTION CONTROL PLANT
SUSPENDED SOLIDS LOADING & REDUCTION

MONTH	RAW SEWAGE		PRIM. EFF.		PRIM.REMOVAL		FINAL EFF.		TOTAL REMOVAL	
	PPM	LBS/DAY	PPM	LBS/DAY	LBS/DAY	%	PPM	LBS/DAY	LBS/DAY	%
Jan.	224	832	76	280	552	66	87	322	510	61
Feb.	152	620	74	300	320	52	78	308	312	51
March	239	1310	114	625	685	53	77	320	990	67
April	151	1010	79	530	480	48	94	630	380	38
May	169	710	84	352	358	50	80	338	372	53
June	115	410	59	210	200	49	61	218	192	47
July	214	806	56	210	596	74	7	26	780	97
Aug.	-	-	-	No record		-	-	-	-	-
Sept.	166	606	92	337	271	44.5	7	25	581	96
Oct.	294	1345	78	355	990	73.5	8	36	1309	97
Nov.	260	1102	83	352	750	68	36	153	949	86
Dec.	-	-	-	No record		-	-	-	-	-
Average	193		83				72			63

Note: Averages are based on the average of all samples for the year not on monthly averages.

D) CHLORINATION

Chlorination of the final effluent was carried out between May 19th and December 31st, 1962. A total of 4488 pounds of chlorine was required to treat 92.7 million gallons during the above period. This represents an average chlorine dosage of 4.8 ppm.

The chlorine contact chamber has a volume of 15,400 gallons which provides for a 29.6 minute contact time at design flow. The average contact time for the average daily flow of 443,000 was therefore 50 minutes.

Chlorination data is given in Table V.

TABLE V
CHLORINE DATA
ORANGEVILLE WATER POLLUTION CONTROL PLANT

MONTH	CHLORINE USED (LBS)	FLOW (M.G.)	DOSAGE PPM
May 19-31	150	5.480	2.75
June	598	10.746	5.5
July	599	11.701	5.1
August	600	11.298	5.3
September	526	11.030	4.8
October	608	14.198	4.3
November	729	14.042	5.2
December	678	14.181	4.8
Yearly Total	4488	92.676	4.8

(E) SLUDGE DISPOSAL

There are no sludge digestion facilities at this plant. Raw sludge is pumped to a holding tank where it is trucked away or placed on drying beds.

During the past year a total of 520,500 gallons of sludge was handled of which 325,200 gallons or 62% was hauled away. The remaining 195,000 gallons or 38% was placed on the drying beds. The cost of liquid sludge haulage for the year was \$2,175.00.

F) PLANT SUPERVISION

The plant receives 40 hours supervision per week by Mr. C. Clarke, the plant operator. Mr. Clarke is an able conscientious operator and does a commendable job of operating the plant. The 40 hours of supervision is arranged in such a manner as to provide for inspections on Saturday and Sunday.

Daily laboratory tests are carried out by Mr. Clarke in order to control the process. Routine samples are also collected and submitted to the OWRC laboratory for analysis. Mr. Clarke is also responsible for maintaining all the equipment, grounds and buildings.

The operation of the project is under the supervision of the Division of Plant Operations. During the year 16 visits were made by the head office project engineer, 9 visits by head office electronics staff and 10 visits made by head office maintenance staff. Approximately 45 purchase orders were processed by the head office staff during the year.

There is no charge to the plant for any of the above head office services.

During the year Mr. Clarke successfully completed the Intermediate Sewage Operator's Course held in Toronto. He should be congratulated for his efficient operation of the plant during the year 1962.

IV COST DATA

(A) CAPITAL COST

The capital cost of this OWRC project, 58-S-16, was \$180,350.00.

(B) RESERVE FOR CONTINGENCIES

As of December 31, 1962 there was a total of \$15,899 in the reserve fund. The money in this fund is to be used in case of emergency or major repairs. The money in this fund is earning interest at 5 1/4%.

(C) OPERATING COSTS

The following is the operating budget for the year 1962 together with actual expenditures. A more detailed breakdown of costs will be found in Table VI.

<u>ITEM</u>	<u>BUDGET</u>	<u>EXPENDITURE</u>
Payroll	4,800	4,333.05
Fuel	600	394.07
Power	2,000	1,099.01
Chemicals	1,000	1,105.56
General Supplies	1,200	357.74
Equipment	800	21.87
Maintenance & Repairs	1,000	215.16
Sludge Haulage	3,000	2,175.00
Sundry	1,100	914.51
Contingency	500	
Total	\$16,000	\$10,616.07

TABLE VI

ORANGEVILLE WATER POLLUTION CONTROL PLANT

OPERATING COSTS

MONTH	EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIP.	REPAIRS & MAINT.	SUNDRY	SLUDGE
JAN.	532.17	320.52		76.41	96.40		33.59			4.75	
FEB.	727.51	305.76			118.88		59.48			18.39	225.
MARCH	918.46	379.30		180.29	93.64	28.60	56.32	21.87		83.44	75.
APRIL	472.69	318.00		22.79	0.25*		5.54			26.61	100.
MAY	904.21	400.02		26.49	103.81		9.64		202.96	36.29	125.
JUNE	1741.21	318.00			117.42	334.22	24.63			596.94	350.
JULY	611.17	327.35			101.36	41.28*	24.80			23.94	175.
AUG.	1209.44	477.00			104.82	345.57	38.31			18.74	225.
SEPT.	716.12	318.00			50.69	115.88	28.01			28.54	175.
OCT.	1162.53	318.00		34.65	96.51	101.72	12.75			348.90	250.
NOV.	886.87	318.00		25.72	103.18	105.07	36.12		12.20	36.58	250.
DEC.	733.69	533.10		27.72	112.05	115.88	28.55			83.61*	225.
TOTAL	10,616.07	4,333.05		394.07	1,099.01	1,105.56	357.74	21.87	215.16	914.51	2,175.

* CREDIT

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